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NEW ENGLAND TRANSPORTATION CONSORTIUM

ANNUAL REPORT
For Calendar Year 1995

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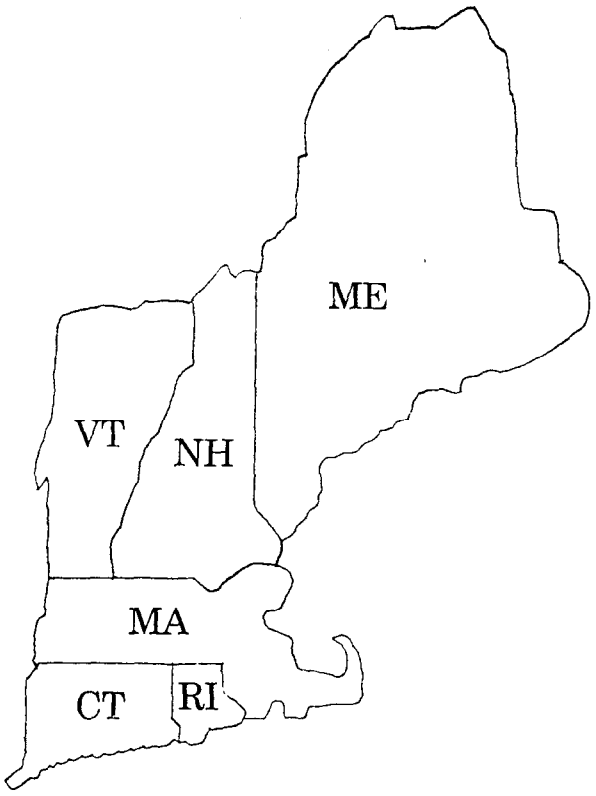
NETCR 3

March, 1996



TRANSPORTATION INNOVATIONS AND IMPROVEMENTS FOR THE FUTURE

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This report was sponsored by the New England Transportation Consortium, a cooperative effort of the Departments of Transportation, the Land Grant Universities of the six New England States, and the US Department of Transportation's Federal Highway Administration.

NEW ENGLAND TRANSPORTATION CONSORTIUM

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A. INTRODUCTION

The New England Transportation Consortium is a cooperative effort of the transportation agencies of the six New England States. Through the Consortium, the states pool their professional, academic, and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation and maintenance of the region's transportation system.

The Consortium functions through a committee structure consisting of the Policy Committee, the Advisory Committee and Project Technical Committees; a lead state; and, a Coordinator.

B. 1995 ACCOMPLISHMENTS

Seven New Research Projects Initiated

Research projects covering: structural analysis of subbase materials, nondestructive testing of reinforced concrete bridges, the use of tire chips to limit frost damage to pavements, wetlands, increased longevity for thermoplastic pavement markings, improved bridge expansion joints, and improved standards for pavement ride quality involving researchers from four of the region's State universities and two of the region's private institutions were initiated.

Design Developed For A Prototype Sidewalk Mounted Bridge Rail For New England States

The Consortium's bridge rail project developed a design for a prototype sidewalk-mounted bridge rail. The rail will be constructed and crash tested in 1996.

Construction of The World's Second Largest 'Retaining Wall Backfill Pressure Testing Facility' Completed At The University of Maine, Orono With Funding From The New England Transportation Consortium For Tire Chip Research

Utilizing this unique testing facility, researchers from the University of Maine, carrying out Consortium funded research, have found that the use of tire chips in backfill material can reduce the horizontal pressure on retaining walls by 50%.

Researchers at the University of Maine are making the results of this research available to the Scrap Tire Management Council and the American Society for Testing Materials for use in the development of standard specifications for civil engineering applications of scrap tires.

Connecticut Joins The New England Transportation Consortium

With Connecticut joining in 1994, the Consortium, for the first time since its formation on February 17, 1988, had representation from all of the region's State Transportation Agencies and State Universities.

Consortium Policies & Procedures Updated

Following a number of meetings, in-depth discussions and reviews by the Advisory Committee, a Policies and Procedures manual for the Consortium was approved by the Policy Committee and published.

The Policies and Procedures manual provides information on the Consortium's: goals, membership, committee responsibilities, administrative management, financial reports, and process for developing and funding research proposals.

Standardized Agreement Developed for NETC Research Projects

Working with staff from the research grants administrative offices of the six New England State Universities, a standardized agreement was developed for NETC funded research projects. The standardized agreement will ensure a more efficient and effective process for execution of agreements with the Universities.

Fourteen Papers/Reports And Presentations Developed From Consortium Sponsored Research During 1995

The following papers/reports and presentations, arising from Consortium sponsored research, were produced during 1995:

Construction Costs of New England Bridges:

-"Construction Costs of New England Bridges" (Draft Final Report), November 30, 1995.

-Presentation to the Annual Maine Transportation Conference, December 7, 1995.

Tire Chips As Light-Weight Backfill for Retaining Walls:

-"Tire Chips as Lightweight Subgrade and Retaining Wall Backfill," by Dana N. Humphrey and Thomas C. Sandford, *Symposium on Recovery and Effective Reuse of Discarded Materials and By-Products for Construction of Highway Facilities*, FHWA, Denver, Colorado, October 19-22, 1993.

-"Use of Tire Chips as Subgrade Insulation & as Lightweight Fill for Highway Construction," by Dana N. Humphrey, *18th Annual Meeting of the Asphalt Recycling and Reclaiming Association*, in Pompano Beach, Florida, on February 23-26, 1994.

-Presentation to the New England Environmental Expo on use of tire chips in highway construction, Boston, May 9, 1995.

-"Civil Engineering Applications of Chipped Tires" short course presented to the Nebraska Department of Environmental Quality in Omaha and North Platte, Nebraska on November 15 and 16, 1995.
-"Tire Chips for Highway Construction" presented to the Northeast Recycling Council in Sturbridge, Massachusetts on December 8, 1995.
-Dr. Humphrey is working with the Scrap Tire Management Council and the American Society for Testing and Materials to develop standard specifications for civil engineering applications of scrap tires.

New England Vehicle Classification and Truck Weight Program:
-Presented the Progress Report and its results at the 1995 Transportation Research Board (TRB) Annual Meeting's Highway Traffic Monitoring Committee.
-Presented paper at the 1994 National Traffic Data Acquisition Conference in Rocky Hill, Connecticut.

Structural Analysis of New England Subbase Materials and Structures:
-A class lecture was prepared and presented December 6, 1995 to the URI CVE 601 Graduate Seminar class on virgin and recycled subbase materials.
-A class lecture was presented to the URI CVE 591A NonBituminous Transportation Materials and Mix Design class on 12/06/95.

Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes:
-A lecture was prepared and presented on November 14, 1995 to the URI CVE 601 Graduate Seminar class on pavement marking materials along with a summary of the objectives and methodology of the traffic marking recess project.
-A class lecture was presented on December 6, 1995 to the URI CVE 591A Non-Bituminous Transportation Materials and Mix Design class on pavement marking materials along with a summary of the objectives and methodology of the traffic marking recess project.
-A preliminary bid proposal with specifications has been developed by the URI research team.

C. PROGRESS OF ACTIVE PROJECTS

PROJECT NUMBER: None

PROJECT TITLE:
Construction Costs of New England Bridges

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
John A. Alexander and Habib Dagher, Department of Civil Engineering, University of Maine

PROJECT OBJECTIVE(S):
According to FHWA data, the average bridge replacement costs in New England are substantially higher than those in other regions of the nation.

The specific objectives of this study are:

A. To determine if the method of data collection and reporting accurately reflects the relative unit costs of bridge construction.
B. To determine what underlying reasons exist for these cost differences and if these reasons are justified.
C. To draw conclusions and provide recommendations as appropriate for cost saving measures.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
All work on the project has been completed through the preliminary final report, dated November 30, 1995, submitted to NETC.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT:

A. "Construction Costs of New England Bridges, (Draft Final Report), November 30, 1995.
B. The work accomplished under the project was presented at the Annual Maine Transportation Conference on December 7, 1995 (attendance over 400).

PROJECT NUMBER: None

PROJECT TITLE:
Tire Chips as Lightweight Backfill for Retaining Walls, Phase II Full Scale Testing

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
Dana N. Humphrey and Thomas C. Sandford, Department of Civil and Environmental Engineering, University of Maine Orono

PROJECT OBJECTIVE(S):
The objectives of this project are:

1. To conduct full-scale tests using tire chips as backfill behind a 15-ft. high instrumented retaining wall supplemented with numerical analysis of the tests.
2. To prepare design guidelines for use of tire chips as retaining wall backfill.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
This phase of the project builds on Phase I which determined the engineering properties of tire chips and indicated that tire chip backfill has the potential to produce low horizontal stresses on retaining walls. It is expected that use of tire chip backfill will lower the cost of retaining wall construction and will put some of this nation's 2 billion waste tires to a beneficial use.

Testing Facility. The full scale testing facility is the second largest of its kind in the world. The facility is 15 ft by 15 ft in plan with 16 ft high reinforced concrete side walls. The front wall has a reinforced concrete face supported by a structural steel frame. The front wall can be rotated about its base to achieve active earth pressure conditions. It is instrumented with load cells and pressure cells to measure the pressure of the backfill on the front wall. The back wall is timber lagging supported by a structural steel frame. The back wall is removed to unload the facility. A surcharge of 750 psf can be applied to the backfill using 216 concrete blocks with a weight of 700 lb each. A gantry crane with a 3 ton capacity was constructed on top of the facility. It is used to lift backfill into the facility and to place the concrete surcharge blocks.

Construction of the facility was performed by the graduate student on the project, Jeff Tweedie, and the principal investigator, Dana Humphrey, with the help of several undergraduates. Construction began on June 4, 1993. The upper 3 to 7 feet of soil at the site was fill composed of a random mixture of soil, rocks, tree stumps, and cinders. It was removed and replaced with compacted granular soil. Forms for the concrete foundation slab were constructed and the reinforcing was placed. The concrete for the foundation slab was placed on June 17, 1993. The next step was to place the reinforcing for the two concrete side walls, followed by erection of the wall forms. The

concrete for the side walls was placed on July 9, 1993. The reinforced concrete face was placed on the supporting structural steel frames on August 18, 1993.

The 3-ton gantry crane was erected on August 26 and 27, 1993. The concrete surcharge blocks were cast 21 at a time from August, 1993 through October, 1993. The front panels were placed and the instrumentation was installed during the Winter of 1993-4 and Spring, 1994. Construction of the facility was completed on June 30, 1994. In total, approximately 115 cy of concrete, 8 tons of reinforcing steel, and 15 tons of structural steel were used to construct the facility. Much of the structural steel was donated by the Cianbro Corp., Pittsfield, Maine, and Owen J. Folsom Construction, Old Town, Maine. Their assistance was greatly appreciated.

Testing Program. Tests were conducted on gravel and tire chips from three producers. For each trial the backfill was compacted in 8-in. lifts with a vibrating plate compactor for the gravel and with a vibrating walk-behind roller for tire chips. After the backfill was placed the surcharge blocks were applied. During backfill and surcharge placement, measurements were taken of the pressure exerted by the backfill on the wall. The pressure at the base of the wall, with the full 750 psf surcharge was less than half of the value expected for gravel backfill. This validates the basic premise of the research project, namely that tire chips exert a much lower horizontal pressure than typical retaining wall back fills. Settlement of the backfill caused by placement of the surcharge was also measured. Settlements measured for the trials with tire chips compared favorably to values expected based on laboratory compressibility tests conducted as part of an earlier NETC project. The trial with gravel was conducted in July and August, 1994. Trials with two types of tire chips were conducted in the Fall of 1994. The trial with the third type of tire chip was conducted in the Summer and Fall, 1995. Testing was completed on October 13, 1995. Dr. Humphrey is working with the Scrap Tire Management Council and the American Society for Testing and Materials to develop standard specifications for civil engineering applications of scrap tires.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT:

1. "Tire Chips as Lightweight Subgrade and Retaining Wall Backfill," by Dana N. Humphrey and Thomas C. Sandford, *Symposium on Recovery and Effective Reuse of Discarded Materials and By-Products for Construction of Highway Facilities*, FHWA, Denver, Colorado, October 19-22, 1993.
2. "Use of Tire Chips as Subgrade Insulation & as Lightweight Fill for Highway Construction," by Dana N. Humphrey, *18th Annual Meeting of the Asphalt Recycling and Reclaiming Association*, in Pompano Beach, Florida, on February 23-26, 1994.

3. Presentation to the New England Environmental Expo on Use of Tire Chips in Highway Construction, Boston, May 9, 1995.
4. Presentation to the AASHTO Region I RAC Meeting on use of tire chips in highway construction, Portland, Maine, May 23, 1995.
5. "Civil Engineering Applications of Chipped Tires" short course presented to the Nebraska Department of Environmental Quality in Omaha and North Platte, Nebraska on November 15 and 16, 1995.
6. "Tire Chips for Highway Construction" presented to the Northeast Recycling Council in Sturbridge, Massachusetts on December 8, 1995.

PROJECT NUMBER: None

PROJECT TITLE:
New England Vehicle Classification and Truck Weight Program

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
John Collura, Professor, Department of Civil and Environmental Engineering, University of Massachusett, Amherst

PROJECT OBJECTIVE(S):
The objective of this study is to determine the suitability of combining traffic volume, vehicle classification and truck weight data collection efforts in the six-state region of New England.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
Phase One, including the identification and review of traffic monitoring data procedures and an analysis of volume classification and weight data for each of the six New England state highway agencies, has been completed. A Draft Report on Phase I was submitted to the Project Technical Committee.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT:

1. Presented the Progress Report and its results at the 1995 Transportation Research Board (TRB) Annual Meeting's Highway Traffic Monitoring Committee.
2. Presented Paper "An Analysis of Vehicle Class and Truck Weight Patterns in New England," by Frederick P. Orloski, FHWA, Albany, New York, and John Collura, University of Massachusetts, Amherst, at the National Traffic Data Acquisition Conference (NATDAC), 1994, Rocky Hill, CT.

PROJECT NUMBER: None

PROJECT TITLE: Bridge Rail Crash Test (Sidewalk Mounted Rail) - Phase II

PROJECT OBJECTIVES: To produce a crash tested rail design acceptable to FHWA for use in all New England states.

PRINCIPAL INVESTIGATOR: James E. Tukey, Bridge Design Engineer, Maine Department of Transportation

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
Initiated in 1988, this project developed the design for a 2-bar curb-mounted bridge rail and successfully crash tested it at AAHSTO Performance Level 2 (PL-2) in December, 1994. In February 1995, based on a recommendation from the Bridge Rail Crash Test Technical Committee, funds were allocated to develop and test a sidewalk-mounted bridge rail. With the Technical Committee's approval of a 4-bar sidewalk mounted bridge rail prototype design in September, 1995, the NETC Lead Agency was directed by the Advisory Committee to proceed with the development of an agreement with FHWA for the crash testing of the 4-bar sidewalk mounted prototype design. A draft scope of work for the crash test RFP was developed by FHWA in December, 1995 and subsequently submitted to the project Technical Committee for review.

REPORTS/PAPERS DEVELOPED, PRESENTATION MADE:
-4-Bar Sidewalk-Mounted Prototype Bridge Rail Design

PROJECT NUMBER: 94-1

PROJECT TITLE:
Structural Analysis of New England Subbase Materials and Structures

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
Professor K. Wayne Lee, Adjunct Associate Professor Milton T. Huston, and Graduate Research Assistant, Jeffrey S. Davis, University of Rhode Island

PROJECT OBJECTIVE(S):
The objectives of this research are:

1. To compile a database of subbase aggregate properties by aggregate types common to New England.
2. To collect data from existing analyses of natural aggregates and recycled material/aggregates blends.
3. Develop recycled material blends.
4. Recommend appropriate testing for State agencies to develop optimum properties for specific sources and various combinations of blended materials projects.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:

Task 1. An extensive literature review was conducted. Published sources were reviewed for the most current research.

Task 2. The issue of data and sample material collection was resolved by Mr. Leo Stevens, Chairman of the technical committee. A request for subbase material specifications was sent to the Chief Engineer's office of each participating NETC state on December 4, 1995. Responses have been received from Rhode Island, Vermont, Massachusetts, and Connecticut.

Task 3: Collection of aggregates and recycled materials has begun. Rhode Island has supplied initial samples. Vermont, Connecticut, and Massachusetts have provided contacts for collecting materials.

Task 4: An experimental design has been formulated.

Task 5: Preliminary laboratory testing for classification has begun with the samples provided by Rhode Island.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT:

1. A class lecture was prepared and presented December 6, 1995 to the URI CVE 601 Graduate Seminar class on virgin and recycled subbase materials.
2. A class lecture was presented to the URI CVE 591A NonBituminous Transportation Materials and Mix Design class on 12/06/95.

PROJECT NUMBER: 94-2

PROJECT TITLE:
Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
Dryver R. Huston, University of Vermont

PROJECT OBJECTIVE(S):
The overall goal of this project is to advance the state-of-the-art in ground-penetrating-radar (GPR) imaging techniques so that it will become an even more practical and precise tool for assessing the integrity of reinforced concrete bridge decks, with particular attention directed towards the specific problems of New England bridges.

Specifically the objectives of the project are:
1. To develop a numerical model of the interaction of defects in concrete bridge decks and GPR.
2. To verify the numerical model through laboratory testing of specimens with known defects.
3. To develop radar waveform image processing techniques which will readily identify defects.
4. To field test the techniques on selected New England bridge structures.
5. To document the developed technology for use by state transportation agencies.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
The primary activities during this period focused on getting the project started. This involved tidying up the necessary contractual details and undertaking a set of planning discussions and a group meeting in Concord, New Hampshire on 12/21/95.

The group meeting involved D. Huston, K. Maser, and W. Weedon. In this meeting the key objectives and directions of the project were discussed. During this meeting a testing procedure was discussed that could have superior performance characteristics to the originally-planned system that used rented off-the-shelf equipment The new procedure would use a high-frequency network analyzer to generate the radar pulses and to preprocess the returning signal. The advantage of the network analyzer scheme is that it can vary pulse frequency and phase and can accomodate different antenna geometries. The variation of pulse width and phase for signals at a given test

point could give a much better resolution radar image. Additional items that were discussed were the various options on numerical modeling techniques and the hardware and procedures that were necessary to conduct the bridge deck testing.

An additional accomplishment during this period is that the graduate student position on the project has been filled by Chris Adam. Chris is a Mechanical Engineering Masters Degree candidate at the University of Vermont. He has an undergraduate degree from Alfred University specializing in ceramics.

REPORTS/ PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT: None

PROJECT NUMBER: 95-1

PROJECT TITLE:
Use of Tire Chips/Soil Mixtures to Limit Frost Heave and Pavement Damage of Paved Roads

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
Dana N. Humphrey, Department of Civil and Environmental Engineering, University of Maine

PROJECT OBJECTIVE(S):
The objective of this research is to determine the tire chip/soil mixture ratio, tire chip/soil mixture layer thickness, and thickness of overlying soil cover (distance from top of tire chips/soil mixture layer to bottom of pavement) that will optimize the thermal resistivity and permeability without resulting in excessive deflections in the flexible bituminous pavement layer.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
The signed contract for the project was received on November 13, 1995. This allowed the research team to officially begin work on the project. To expedite start up of the project, the principal investigator prepared a draft test protocol (Task 2a) in July, 1995 and distributed it to the project technical committee for their review. After reviewing the test protocol, the technical committee felt that the progress meeting specified in Task 2b was unnecessary. During the Summer of 1995, students supported by other funds constructed the apparatus to measure thermal conductivity of tire chip/soil mixtures. In addition, the large scale permeability apparatus constructed as part of a previous NETC project was improved by the addition of a constant head tank on the in-flow side of the apparatus which allows for more accurate control of the gradient applied across the sample. This work allowed testing to begin as soon as the contract was received.

The students on the project team are: (1) Melissa Chen, Graduate Research Assistant, who will perform laboratory measurements of the thermal conductivity of tire chips, gravel, and gravel/tire chip mixtures; and (2) Brian Lawrence, Undergraduate Researcher, who will conduct the permeability tests.

Work was begun on laboratory portions of this study. Thermal conductivity and permeability tests have been conducted on tire chips from two producers, gravel with no tire chips, and one mixture of tire chips and gravel.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT: None

PROJECT NUMBER: 95-2

PROJECT TITLE:
Suitability of Non-Hydric Soils for the Mitigation of Wetlands

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
Dr. Larry K. Brannaka, Department of Civil Engineering and Dr. Chris Evans, Department of Natural Resources, University of New Hampshire

PROJECT OBJECTIVE(S):
The objectives of this research are three-fold. Specifically they include the following:

1. Identify the characteristics and properties of non-hydric soils which have been successfully used in existing wetland mitigation projects.
2. Describe the site conditions that will influence the success of using non-hydric soils for wetland mitigation.
3. Develop recommendations for the selection of non-hydric soils or non-hydric soil amendments for mitigation purposes based on existing site conditions.

The final objective depends on successfully completing the preceding objectives.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
In this initial period, the main effort has been on the literature review and in establishing field sites for our second phase field investigations. The literature review has included searches of data bases on journal articles from the UNH library system, and also the Internet. We are currently in the process of identifying, retrieving, and reviewing articles from these sources. The effort put forth on this task constitutes about 40% of the literature review task. The search is continuing as currently retrieved articles lead to additional sources of information. To date, very little has been found in the literature on mitigation projects using anything other than hydric soils. It is still too early in the study to identify any correlations from the literature.

The second part of the literature review is to identify field sites for the second phase field investigation. To date, contacts have been made with the regulatory agencies in each of the New England States responsible for the regulation of wetlands. Initial contacts were made through the technical committee members for this project and contacts have branched out from there. This effort represents approximately 10% of the second phase field investigation effort. Several potential sites have been identified which may be used for the second phase field investigations. The sites identified have not had non-hydric soils imported to the site to construct the wetlands, but in each case the wetlands were constructed directly on an existing non-hydric

soil. The sites under consideration at this point include two sites in New Hampshire, one in Vermont, and two in Rhode Island. There is some question as to whether access can be gained to the site in Vermont. The age of the sites under consideration so far ranges from approximately 10 months to over ten years. The difference in ages will allow us to examine the time progression of wetland formation in non-hydric soils.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT:

None. The project is still in its initial stages. No reports have been written to date.

PROJECT NUMBER: 95-3

PROJECT TITLE:
Implementation and Evaluation of Traffic Marking Recesses For Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
K. Wayne Lee and Stephen A. Cardi, II and Sean Corrigan, The University of Rhode Island

PROJECT OBJECTIVE(S):
1. To determine the best means, taking into account retroflectivity, durability and cost effectiveness, by which traffic marking recesses can be created to eliminate damage from snow plow blades.
2. To develop traffic marking recess application and equipment specifications for use by highway agencies.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
An extensive literature review was conducted mainly utilizing TRIS and a current status of knowledge is being developed. The following topics have been reviewed mainly from Transportation Research Records: thermoplastic, retroreflectivity, glass bead gradations, durability, wet-night retroflectivity, and the effects of snow plows on the service life of thermoplastic have been reviewed. Recent research reports from other state DOT's concerning the durability and retroreflectivity of marking materials including thermoplastic are in the process of being acquired.

Typical contracts awarded for road striping along with the specifications have been secured from each of the six New England states with the assistance of the Technical Committee.

Preliminary research on the best means of creating traffic marking recesses is in progress. The URI research team has narrowed the proposed methods down to one, the use of a power grinder to mill out the recesses. In order to obtain smooth flush edges on both sides of the 6" wide recesses on open graded asphalt friction course, it will be necessary to use a pavement saw to cut the edges of the recesses, prior to the milling process.

A preliminary bid proposal with specifications has been developed by the URI research team.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT:

A lecture was prepared and presented on November 14, 1995 to the URI CVE 601 Graduate Seminar class on pavement marking materials along with a summary of the objectives and methodology of the traffic marking recess project.

A class lecture was presented on December 6, 1995 to the URI CVE 591A Non-Bituminous Transportation Materials and Mix Design class on pavement marking materials along with a summary of the objectives and methodology of the traffic marking recess project.

PROJECT NUMBER: 95-5

PROJECT TITLE:
Buried Joints in Short Span Bridges

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
George Tsiastas and Wayne Lee, University of Rhode Island

PROJECT OBJECTIVE(S):
The objective of project 95-5 is to determine the viability of buried joints in short span steel and concrete bridges in New England states.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
Task 1: Completed: 100%

Completed literature review on buried joints and other existing joint systems.

Buried joints: Technical publications were reviewed in detail to determine basic design concepts, critical design factors, details and feasibility of buried joints. Present studies show that they are suitable for short-span concrete and prestressed bridges and able to accommodate a movement range of about 20 mm. with reduced maintenance costs. Trials have not included steel bridges. In steel bridges the rotational movements are large and occur at increased frequency. To ensure structural integrity, depending on the existing configuration, modifications to bearings may be necessary. Two conceptual details outlining basic design concepts are identified.

Buried joints provide a simple approach to effectively accommodate joint movements and show great potential as a viable option for bridge deck joints in short span bridges.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT: None

PROJECT NUMBER: 95-6

PROJECT TITLE:
Guidelines for Ride Quality Acceptance of Pavements

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY:
John Collura, Professor, Department of Civil and Environmental Engineering, University of Massachusett, Tahar El Korchi, Professor, Department of Civil Engineering, Worcester Polytechnic Institute

PROJECT OBJECTIVE(S):
The objective of this study is to formulate specifications and implementation procedures for ride quality, on new pavements, suitable and appropriate for use in New England.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 1995:
Began to conduct literature review.

REPORTS/PAPERS DEVELOPED, PRESENTATIONS MADE FROM THIS PROJECT: None

D. FINANCIAL STATUS
Active Projects

Table 1: Financial Status Of Projects Active During 1995 (As Of 12/31/95)

PROJECT	APPROVED BUDGET	INVOICED TO DATE	PROJECT BALANCE
An Analysis of Construction Costs of New England Bridges--PHASE II *P.I.: John Alexander, University of Maine, Orono*	39,500.00	27,318.16	12,181.84
Tire Chips As Lightweight Backfill--PHASE II *P.I.: Dana Humphrey, University of Maine, Orono*	111,000.00	111,000.00	0.00
Bridge Rail Crash Test--Sidewalk Mounted Rail--PHASE II *PI: James E. Tukey, Maine DOT*	120,000.00	0.00	120,000.00
New England Vehicle Classification And Truck Weight Program *P.I.: John Collura, University of Massachusetts*	75,000.00	59,683.24	15,316.76
94-1: Structural Analysis of New England Subbase Materials And Structures *P.I.: K. Wayne Lee, University of Rhode Island*	74,997.00	4,821.80	70,175.20
94-2: Nondestructive Testing Of Reinforced Concrete Bridges Using Radar Imaging *P.I.: Dryver Huston, University of Vermont*	224,903.00	0.00	224,903.00

Table 1: Financial Status Of Projects Active (As Of 12/31/95) (continued)

95-1: Use of Tire Chips/Soil Mixtures To Limit Frost Heave And Pavement Damage of Paved Roads *P.I.: Dana Humphrey, University of Maine, Orono*	75,000.00	1,551.24	73,448.76
95-2: Suitability Of Non-Hydric Soils For Wetland Mitigation *P.I.s: Larry Branaka & Christine Evans University of New Hampshire*	39,914.00	0.00	39,914.00
95-3: Implementation And Evaluation of Traffic Marking Recesses For Application Of Thermoplastic Pavement Markings On Modified Open Graded Mixes *P.I.s: K. Wayne Lee, University of Rhode Island*	107,313.00	0.00	107,313.00
95-5: Buried Joints In Short Span Bridges *P.I.s: George Tsiatas and K. Wayne Lee, University of Rhode Island*	64,910.00	0.00	64,910.00
95-6: Guidelines For Ride Quality Acceptance Of Pavements *P.I.s: John Collura, University of Massachusetts, Amherst;Tahar El Korchi, and N. Wittels, Worcester Polytechnic Institute, Worcester*	106,124.00	0.00	106,124.00

Fund Balance

Table 2: NETC Fund Balance (As Of 12/31/95)

ITEM	ALLOCATION	ENCUM-BRANCE	CUM. BALANCE
Unexpended balance from AASHTO as of 6/5/95 (per AASHTO memo 12/4/95)			132777.07
Member Allocations 1994 = 6 x $75,000	450000		582777.07
Coordination/Administration of NETC: Calendar Year 1995		73042	509735.07
Continued Projects:			
High Construction Costs of New England Bridges-Phase II		39500	470235.07
Tire Chips as Lightweight Backfill-Phase II		16000	454235.07
Bridge Rail Crash Test (Sidewalk Mounted Rail)-Phase II		120000	334235.07
New England Vehicle Classification and Truck Weight Program		15317	318918.07
Member Allocations 1995 = 7 x $75,000	525000		843918.07
"95" Project Series:			
95-1: Use of Tire Chips/Soil Mixtures to Limit Pavement Damage of Paved Roads		75000	768918.07
95-2:Suitability of Non-Hydric Soils for Wetland Mitigation		39914	729004.07
95-3:Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes		107313	621691.07
95-5:Buried Joints in Short Span Bridges		64910	556781.07
95-6:Guidelines for Ride Quality Acceptance of Pavements		106124	450657.07
"94" Project Series:			
94-1:Structural Analysis of New England Subbase Materials And Structures		74997	375660.07
94-2:Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques		224902	150758.07
Coordination/Administration of NETC: Calendar Year 1996		75000	75758.07
CURRENT FUND BALANCE			75758.07

Note: Per Dec. 4, 1995 memo to Dougan from Francois, bal. of NETC funds available as of 6/5/95 = $132,777.07